Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2018-118-RC2, 2018

Atmospheric Measurement Techniques Discussions

Interactive comment on "The Global Ozone Monitoring Experiment: Review of in-flight performance and new reprocessed 1995–2011 level 1 product" *by* Melanie Coldewey-Egbers et al.

Anonymous Referee #2

Received and published: 18 June 2018

1) Scientific Significance: The manuscript provides a good description of the methods and results of a study to evaluate and improve the stability of the GOME Level 1 record.

2) Scientific Quality: The results are well-structured and well-referenced and use good statistical analysis methods. There are good references to detailed reports for interested readers.

3) Presentation Quality: The paper is well-written and the figures and tables are good in both content and structure.

Editorial Comments and Suggestions:

Printer-friendly version

Discussion paper

Make Figure 2 larger. It should at least be full page width.

In Section 2.3.2, rewrite and clarify the last line. Is this 10% the accuracy of the stray light estimates relative to the true stray light? That is, is if the stray light error is 20 units, then the correction will be between 18 and 22 units and the final result will have an error of ± 2 units?

Page 19, Line 14, “raise” should be “rise”.

The value of 1100 for the SNR for Channel 1 in the Table 1 seems high even for the 305 nm wavelength. What is the corresponding integration time and the size of the FOV? I believe there was a change in the Channel 1A/1B wavelength boundary during the mission. Is this before or after that change? Also, provide an SNR value for a shorter wavelength in the table, say 290 nm.

While the views of the Moon are complicated by scan mirror differences with angle and the phases of the Moon, more accurate lunar models are now available. For example, Eumetsat’s GSICS Implementation of the ROLO model (GIRO) and the GSICS Lunar Observation Dataset (GLOD) introduced at

https://www.eumetsat.int/website/home/News/DAT_3460357.html?lang=EN&pState=1

could be explored to allow the lunar measurements to be used to monitor instrument changes.

Questions on Science:

Section 3.1

Page 11 line 8 et seq. While arguments can be made for estimating degradation by avoiding lines with high solar activity, this will not work well for Channel 1. See

V. Marchenko, Sergey & Deland, Matthew & Lean, Judith. (2016). Solar Spectral Irradiance Variability in Cycle 24: Observations and Models. Journal of Space Weather and Space Climate. 6. 10.1051/swsc/2016036.

for estimates of solar variability for 270 nm to 500 nm over a solar cycle. After estimating the changes in the instrument throughput, the final time-dependent solar provided in Level 1 should be constructed with realistic solar activity variations. Also, how large are the Etalon Effects in Figure 2? What errors would they be expected to produce in the radiance/irradiance ratios? Why wasn't a correction applied? It appears that the authors have access to estimates of these corrections from other analysis:

https://wdc.dlr.de/sensors/gome/degradation_files/degradation.php

And there are the earlier results in

Weber, Mark & Burrows, John & Cebula, R. (1998). GOME Solar UV/VIS Irradiance Measurements between 1995 and 1997 – First Results on Proxy Solar Activity Studies. Solar Physics. 177. 63-77. 10.1023/A:1005030909779.

Section 3.3

From Section 2.3.2, the angle for the mirror for Solar measurements is 41° and those for the Earth measurements range from 49°±15°. What are the results for Figure 6 for the ground pixels at this matching angle? If they are not equal to 1.0 what are the likely instrument changes that produce time-dependent differences in the radiance / irradiance ratios?

Is it correct that the analysis in the section is just an evaluation of errors in the Level 1 product and that no corrections based on the PICS results have been applied? If so, degradation is only shown for 325 nm and 335 nm measurements and the changes are over 20% and differ by over 5%. This does not suggest that the shorter channels are well characterized for absolute radiance / irradiance calibration. All algorithms are sensitive to the reflectance if they need parameters associated with cloud cover. What are the effects of a +10% error in the UV cloud fraction on GODFIT ozone retrievals?

Do the authors recommend that Channel 1 data in this product be used for ozone profile retrievals? What about the use of data from 300-310 for tropospheric retrievals

requiring radiance / irradiance calibration?

Section 4.2

How large are the variations in the wavelength scales along an orbit from measurement-based estimates? Do they match with the variations predicted from the effects of the measured pre-disperser prism temperature changes combined with the laboratory sensitivity characterization or are there other complicating factors? DOAS-based retrievals often generate internal estimates of the wavelength scale shifts as part of the fitting process. Have any of these been compare to this bottom-up analysis based on the prism temperatures?

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2018-118, 2018.

Printer-friendly version

Discussion paper